$\gamma(t) = a_5 t^5 + a_4 t^4 + a_3 t^3 + a_2 t^2 + a_1 t + a_0$ (1)

$t = 0 \quad \rho_0 \; \dot{\rho}_0 \; \ddot{\rho}_0 = v_0 \; a_0$ (4)

$t \Rightarrow t_f \quad \rho_f \; \dot{\rho}_f \; \ddot{\rho}_f = v_f \; a_f$ (5)

$\dot{\gamma}(t) = 5a_5 t^4 + 4a_4 t^3 + 3a_3 t^2 + 2a_2 t + a_1$ (2)

$\ddot{\gamma}(t) = 20 a_5 t^3 + 12 a_4 t^2 + 6 a_3 t + 2a_2$ (3)

$\gamma(0) = a_0, \quad \chi(t_f) = a_5 t_f^5 + a_4 t_f^4 + a_3 t_f^3 + a_2 t_f^2 + a_1 t_f + a_0$

$\dot{\gamma}(0) = a_1, \quad \dot{\chi}(t_f) = 5a_5 t_f^4 + 4a_4 t_f^3 + 3a_3 t_f^2 + 2a_2 t_f + a_1$

$\ddot{\gamma}(0) = 2a_2, \quad \ddot{\chi}(t_f) = 20 a_5 t_f^3 + 12 a_4 t_f^2 + 6 a_3 t_f + 2a_2$

$\rho_0 = a_0, \quad \dot{\rho}_0 = a_1, \quad \ddot{\rho}_0 = 2a_2$

$a_0 = \rho_0$
$a_1 = \dot{\rho}_0$
$a_2 = \ddot{\rho}_0 / 2$

$\chi(t_f) = \rho_f, \quad \dot{\chi}(t_f) = \dot{\rho}_f \quad \ddot{\chi}(t_f) = \ddot{\rho}_f$

$$\rho_f = a_5 t_f^5 + a_4 t_f^4 + a_3 t_f^3 + \frac{\ddot{\rho}_0}{2} t_f^2 + \dot{\rho}_0 t_f + \rho_0$$

$$\dot{\rho}_f = 5a_5 t_f^4 + 4a_4 t_f^3 + 3a_3 t_f^2 + \ddot{\rho}_0 t_f + \dot{\rho}_0$$

$$\ddot{\rho}_f = 20 a_5 t_f^3 + 12 a_4 t_f^2 + 6 a_3 t_f + \ddot{\rho}_0$$

$$\begin{bmatrix} \gamma(0) \\ \chi(t_f) \\ \dot{\chi}(0) \\ \dot{\chi}(t_f) \\ \ddot{\chi}(0) \\ \ddot{\chi}(t_f) \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 \\ t_f^5 & t_f^4 & t_f^3 & t_f^2 & t_f & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 5t_f^4 & 4t_f^3 & 3t_f^2 & 2t_f & 1 & 0 \\ 0 & 0 & 0 & 2 & 0 & 0 \\ 20t_f^3 & 12t_f^2 & 6t_f & 2 & 0 & 0 \end{bmatrix} \begin{bmatrix} a_5 \\ a_4 \\ a_3 \\ a_2 \\ a_1 \\ a_0 \end{bmatrix}$$

$$= A$$

$$\begin{bmatrix} a_5 \\ a_4 \\ a_3 \\ a_2 \\ a_1 \\ a_0 \end{bmatrix} = A^{-1} \begin{bmatrix} x(0) \\ x(t_f) \\ \dot{x}(0) \\ \dot{x}(t_f) \\ \ddot{x}(0) \\ \ddot{x}(t_f) \end{bmatrix} = A^{-1} \begin{bmatrix} p_0 \\ p_f \\ v_0 \\ v_f \\ a_0 \\ a_f \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} \frac{-6}{t_f^5} & \frac{6}{t_f^5} & \frac{-3}{t_f^4} & \frac{-3}{t_f^4} & \frac{-1}{2t_f^3} & \frac{1}{2t_f^3} \\ \frac{15}{t_f^4} & \frac{-15}{t_f^4} & \frac{8}{t_f^3} & \frac{7}{t_f^3} & \frac{3}{2t_f^2} & \frac{-1}{t_f^2} \\ \frac{-10}{t_f^3} & \frac{10}{t_f^3} & \frac{-6}{t_f^2} & \frac{-4}{t_f^2} & \frac{-3}{2t_f} & \frac{1}{2t_f} \\ 0 & 0 & 0 & 0 & 1/2 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\bar{a}_5 = \frac{-6}{t_f^5} p_0 + \frac{6}{t_f^5} p_f - \frac{3}{t_f^4} v_0 - \frac{3}{t_f^4} v_f - \frac{1}{2t_f^3} a_0 - \frac{1}{2t_f^3} a_f$$

$$\bar{a}_4 = \frac{15}{t_f^4} p_0 - \frac{15}{t_f^4} p_f + \frac{8}{t_f^3} v_0 + \frac{7}{t_f^3} v_f + \frac{3}{2t_f^2} a_0 - \frac{1}{2t_f^2} a_f$$

$$\bar{a}_3 = \frac{-10}{t_f^3} p_0 - \frac{10}{t_f^3} p_f - \frac{6}{t_f^2} v_0 - \frac{4}{t_f^2} v_f - \frac{3}{2t_f} a_0 - \frac{1}{2t_f} a_f$$

$$\bar{a}_2 = a_0 \qquad \bar{a}_0 = p_0$$

$$\bar{a}_1 = v_0$$